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| EXAMINER | |
|---|---|
| LUNDGREN, JEFFREY S | |

| ART UNIT | PAPER NUMBER |
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| 1639 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/583,920 | SAILOR ET AL. | |
| | Examiner | Art Unit | |
| | JEFFREY S. LUNDGREN | 1639 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *23 August 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *34,37-42 and 45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *34,37-42 and 45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/23/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### Continued Examination Under 37 CFR 1.114

A Request for Continued Examination under 37 CFR § 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR § 1.114, and the fee set forth in 37 CFR § 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR § 1.114. Applicant's submission filed on August 23, 2010, has been entered.

Claims 34, 37-42 and 45 are pending in the instant application, and are the subject of the Office Action below.

### Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in Graham **v.** John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 34, 37-39 and 45, are rejected under 35 U.S.C. § 103(a) as being unpatentable over Trau et al., U.S Patent No. 2003/0124564, published on July 3, 2003, in view of Li et al., U.S. Patent No. 5,168,104, issued on December 1, 1992, and Nakano et al., U.S. Patent No. 6,778,272, issued on August 17, 2004.

Claim 34 is directed towards an encoded micron-sized semiconductor or insulator particle having an integral and ordered physical multi-layer porosity structure with multiple porosity interfaces between consecutive multiple porosity layers;

the multiple porosity layers having multiple optical thicknesses;

wherein the physical multi-layer structure is configured to produce an optical signature in the form of an interference pattern in the reflectivity spectrum; and

uniquely corresponds to a single particular etching a code from a library of codes that was used to create the particle via a computer waveform controlled etch.

internal structures, which consist of large pores, typically up to 10 m that are linked by small channels of typically about 20 nm diameter.

Trau teaches highly functionalized, porous organosilica particles and methods of their synthesis are described that employ high amounts of functional silane such as 3-mercaptopropyl trimethoxysilane. Silane particle diameters are controlled from less than 1 micron to over 100 micron. The particles have a high surface area due to their internal structures, which consist of large pores, typically up to 10 m that are linked by small channels of typically about 20 nm diameter. Trau states:

> "In a preferred embodiment, **multiple**, for example, six, different types of **particles are made, each having a different thickness of optic coating**. During use, the six types are distinguished on the basis of scattering signals, despite their having the same fluorescent inner regions. This technique is **particularly desirable for use in combinatorial chemistry as it provides another factor for distinguishing particle types. The technique of using light scattering for distinguishing different particle types is facilitated by the high porosity of the particles**. In a preferred embodiment, **the difference in refractive index, more specifically the refractive index profile (e.g. generated by the varying porosity within each particle), gives rise to a unique scattering signature from each particle**."

Trau, paragraph 0091 (emphasis added).

Also described on the particles are thin films that contribute to the porosity variation and allow for the coding:

> "In a corresponding embodiment, different batches of particles are coated with **different thicknesses of clear silicon shell, and the differing optic properties from the altered thicknesses are relied on to distinguish the**

> **particles**. For example, a first group of 0.5 micron average diameter particles are coated with 0.1 micron shell (0.7 micron final diameter), and a second group of 0.5 micron average diameter particles are coated with 0.3 micron shell (1.1 micron final diameter). The first group of particles are optically distinguished from the second group of particles by their different light scattering properties. The second group will more readily scatter 1 micron wavelength light than the first group. Both types are flowed through an imaging flow cell and optic imaging signals are produced that distinguish the different particle types based on their different scattering characteristics.
>
> The scattering properties of the particles can also be altered by incorporation of other materials into the particles either during synthesis (e.g., by incorporating titanium isopropoxide or similar reagent with the silane monomer) or post synthesis. These materials could include Ti and Al to alter the scattering and Fe to give the particles magnetic properties.
>
> In a preferred embodiment, multiple, for example, six, different types of particles are made, **each having a different thickness of optic coating**. During use, the six types are distinguished on the basis of scattering signals, despite their having the same fluorescent inner regions. This technique is particularly desirable for use in combinatorial chemistry as it provides another factor for distinguishing particle types. The technique of using light scattering for distinguishing different particle types is facilitated by the high porosity of the particles. In a preferred embodiment, the difference in refractive index, more specifically the refractive index profile (e.g. generated by the varying porosity within each particle), gives rise to a unique scattering signature from each particle."

Trau, paragraphs 0089-0091 (emphasis added); and

> Additionally, other favorable properties of the particles can be relied on to generate or modulate signals for distinguishing particles. In particular, it will be appreciated that the size of particles used (both carrier and/or optical tag particle) will generate different light scattering signals. Those specific **scattering signals may be used to distinguish particles**. For example, a **larger particle will be distinguished from a smaller particle because the smaller particle will refract light at different wavelengths than a larger particle. Moreover, particles with different refractive index profiles will generate different scattering signatures (e.g. as will result from different porosity profiles)**."

Trau, paragraph 0113 (emphasis added).

Trau also teaches refractive index changes and varying porosity and varying thickness (see captioned sections above).

Claims 37-39 are directed towards "receptors", Trau teaches an antibody (see paragraph 0029). As in claim 41, Trau teaches flourescent tags (see captioned portions above). As in claim 42, Trau teaches silicon particles (paragraphs 0008 and 0013).

Although Trau teaches the preparation of a library of particles meeting the instant invention, he does not explicitly state that the binders are located within the pores of the particles, or teach that the library of particles were prepared from a library of codes via a computer waveform controlled etch.

Li teaches that micron sized silica beads with pores having a binding agents for affinity applications are provided with a ligand that is actually found within the pore structure of the bead (see section titled, Background Art).

Nakano teaches the use of computers to control particle properties and the etching process, and demonstrates how they are routine in the use of methods and protocols for chemical control.

One of ordinary skill in the art would have had a reasonable expectation of success in arriving at the invention as claimed because the implementation of a computer for the design and/or processing of a library of particles is well known for the advantages that computers provide with any of automation, increased speed and/or accuracy and precision of otherwise manual tasks. Furthermore, nothing recited in the claim regarding the use of the computer imparts a material affect to the particle library that would be distinguishable from particles that were not prepared by the use of a computer. Additionally, it is well-known and demonstrated in the art that the upon the formation of porous beads that host ligand binding agents, that the chemical attachment of the ligand binding agent results in the agent residing in the pore. Therefore, the invention as a whole was prima facie obvious at the time it was invented.

Claims 34, 37-42 and 45, are rejected under 35 U.S.C. 103(a) as being unpatentable over Trau, Li and Nakano, as applied to claims 34, 37-39 and 45 above, and further in view of Chan et

al., U.S Patent No. 7,226,733, issued on June 5, 2007, in view of Ghadhiri et al., U.S. Patent No. 6,248,530, issued on June 19, 2001.

The limitations of claims 34, 37-39, and 45, and the applicable teachings of Trau, Li and Nanko, can be found in the rejections above, and are hereby incorporated by reference.

Although Trau, Li and Nakano teach the claimed particles, neither explicitly states that their disclosed particles could be used as a "gas" phase sensor system, or act as a "gas receptor".

Ghadhiri teaches that the measurement of the wavelength shifts in the reflectometric interference spectra of a porous semiconductor substrate such as silicon, make possible the highly sensitive detection, identification and quantification of small analyte molecules. The sensor of the subject invention is effective in detecting multiple layers of biomolecular interactions, termed "cascade sensing", including sensitive detection of small molecule recognition events that take place relatively far from the semiconductor surface, such as various gases adsorbed to the silicon surface.

One of ordinary skill in the art would have had a reasonable expectation of success in arriving at the invention as claimed because Trau and Ghadhiri are directed towards the use of porous semiconductor substrates/particles for optical-based sensing that relies on the use of refractive index variations to create a discernable signal upon a binding event. One of ordinary skill in the art would have recognized the advantages of using and the approach of Ghadhiri with the optically encoded particles of either Trau and/or Chan because of the applications for gas-based sensor. Therefore, the invention as a whole was prima facie obvious at the time it was invented.

**Common Ownership of Claimed Invention Presumed**

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the Examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. §§ 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

## Conclusions

No claim is allowable.

If Applicants should amend the claims, a complete and responsive reply will clearly identify where support can be found in the disclosure for each amendment. Applicants should point to the page and line numbers of the application corresponding to each amendment, and provide any statements that might help to identify support for the claimed invention (e.g., if the amendment is not supported in ipsis verbis, clarification on the record may be helpful). Should Applicants present new claims, Applicants should clearly identify where support can be found in the disclosure.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Jeff Lundgren whose telephone number is 571-272-5541. The Examiner can normally be reached from 7:00 AM to 5:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Joanne Hama, can be reached on 571-272-2911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Jeffrey S. Lundgren/
Primary Examiner, Art Unit 1639